Proceedings of the American Academy of Arts and Sciences

Vol. 77, No. 2, P. 33–54—January, 1949

CENTENNIALS, SESQUICENTENNIALS, AND BICENTENNIALS OF CHEMICAL INTEREST DURING 1949.

By Ernest H. Huntress

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Received November 23, 1948.

The observance of holidays in secular and religious calendars was originally devoted to the remembrance of notable events, circumstances or persons. Science in general and chemistry in particular could profit by seizing appropriate opportunities to remind itself of progress. In the belief that alert students and teachers at all intellectual levels will appreciate a memorandum of special anniversaries falling within the coming year, the present brief treatment has been prepared as a corollary of a long-sustained interest[1,2] in the pedagogical utilization of scientific anniversaries.

Although the present paper is primarily concerned with the anniversaries of birth or death of chemists, the author has allowed himself to include a few representatives of other fields when the subject comprises a development or personality deserving better acquaintance by every broadly educated scientific student. The selected references are mainly restricted to the periodical literature, where a wealth of biographical material of superb character has frequently been ignored. Particular biographies or autobiographies in book form are readily found in library card catalogues and bibliographies; but biographical data included in commonly accessible scientific and technical periodicals seem to be difficult to locate when needed.

The brief memoranda comprising the text for each entry is intended to draw attention to only a few of the highlights of each subject's career and accomplishments. In the selected citations no attempt has been made to distinguish between biographies, jubilees, obituaries, memorials, or other characterizations, all being designated by "B". Portraits, however, are classified as P_1, P_2, P_2 in diminishing order of quality, the highest category being reserved for full-page pictures printed on only one side of the sheet and often on special paper.

[1] Huntress, "Daily Chemical Anniversaries as a Teaching Tool," J. Chem. Education *14*, 328–344 (1937).

[2] Huntress, "The 100th Anniversary of the Birth of F. K. Beilstein," J. Chem. Education *15*, 303–309 (1938).

Red Letter Days During 1949

Jan. 22.	Sesquicentenary of death of Saussure
Jan. 26.	Sesquicentenary of birth of Clapeyron
Feb. 19.	Sesquicentenary of birth of Reich
Mar. 7.	Centenary of birth of Haller
Mar. 23.	Centenary of death of Del Rio
Mar. 24.	Centenary of death of Döbereiner
Mar. 28.	Bicentenary of birth of Laplace
Apr. 25.	Centenary of birth of Klein
Apr. 27.	Centenary of birth of Hill
May 17.	Bicentenary of birth of Jenner
May 24	Centenary of birth of Munroe
July 3.	Bicentenary of death of Jones
July 12.	Centenary of birth of Osler
July 17.	Centenary of birth of Reverdin
July 19	Centenary of birth of Meldola
Aug. 16.	Centenary of birth of Kjeldahl
Sept. 8.	Centenary of birth of Hell
Sept. 27.	Centenary of birth of Pavlov
Oct. 18.	Sesquicentenary of birth of Schönbein
Nov. 3.	Bicentenary of birth of D. Rutherford
Nov. 16.	Centenary of birth of E. S. Dana
Nov. 29.	Centenary of birth of J. A. Fleming
Nov. 29.	Centenary of birth of G. Wagner
Dec. 6.	Bicentenary of death of Black

Saussure, Horace Benedict de

Born Feb. 17, 1740, at Conches, an estate on the Arve River near Geneva, Switzerland; died Jan. 22, 1799, at Geneva, age 59.

This Swiss scientist was primarily geologist and mountain climber, but also botanist, physicist and meteorologist. At age 22 he became professor of philosophy at the Academy (now University) of Geneva where he remained 24 years (1762–1786). His early interest in botany led him to undertake many journeys in the Alps which later served as his geological laboratory. Among his more famous ascents were those of Mount Blanc (1787), Col du Géant (1788), Crammont (1784, 1788), St. Theodule Pass to Zermat (1789), Klein Matterhorn (1792). The description of seven of his Alpine journeys was published as "Voyages dans les Alpes" (4 vols. 1779–96; 8 vols. 1780–96).

Saussure, who is not to be confused with his son Nicolas Theodor de Saussure (1767–1845), was first (1762) to distinguish between epidermis and cortex of plants. He was first to adopt (1779) the term

"geology," whose content had been construed earlier first as part of mineralogy, then of physical geography.

In the meteorological aspects of his work Saussure found ample opportunity to display his inventive talents. He devised (1790) a cyanometer to measure the blue color of the sky and a diaphanometer to indicate the relative transparency of the air. In 1783 he published the famous "Essais sur l'Hygrometrie" [No. 115 (1900) of Ostwald's Klassiker der Exakten Wissenschaften] which is still a model of scientific experiment and reasoning. Here he described the hair hygrometer in which the change in length of a human hair with variations in humidity was caused to move a needle on a dial. Saussure devoted great care to the selection of hairs, to freeing them from grease, and to an exhaustive study of their performance. Although for a century other methods of humidity measurement were favored, the introduction of self-recording instruments has led to renewed use of the hair type. The latest application of his method is in the little meteorographs attached to weather balloons used for determination of meteorological data at high altitudes.

Saussure became (1788) a foreign member of the Royal Society of London, his election occurring at the same meeting as that of Lavoisier.

A "Life of Horace Benedict de Saussure" by D. W. Freshfield was published in 1920 by E. Arnold Co. of London.

Clapeyron, Benoît-Paul-Émile

Born Jan. 26, 1799, at Paris, France; died Jan. 28, 1864, at Paris.

French engineer. Some unresolved doubt exists regarding date of birth (some sources giving Feb. 21, or Feb. 26), but all agree on year as 1799. Clapeyron was student at l'Ecole Polytechnique at Paris. After some practical construction experience including a period in Russia, he became professor of mechanics at l'Ecole de Ponts et Chaussées, Paris.

In 1834 he published in the Journal d'Ecole Polytechnique a classical memoir, "Sur la puissance motrice de la chaleur," which also appeared later in a more generally accessible journal [Ann. Physik. *59*, 446–451; 566–586 (1843)]. He put into analytical form the argument for the extent to which heat can be converted into work (in the case of a perfect gas) first advanced by N. L. S. Carnot. This taken together with application of the first law of thermodynamics (discovered in 1842) enabled Clausius and Lord Kelvin to deduce the theorem now generally known as the second law of thermodynamics. Clapeyron's name is by chemists usually associated with the so-called

Clapeyron equation for calculation of the change in boiling point of a liquid with change of pressure.

On March 22, 1858, Clapeyron was elected a member of the French Academy of Science, succeeding Cauchy, the French mathematician.

Biographical material on Clapeyron is extremely meager and no periodical references have been locatable.

REICH, FERDINAND

Born Feb. 19, 1799, at Bernburg, halfway between Halle and Magdeburg in Freistaat Anhalt, Germany; died April 27, 1882.

Reich commenced studies at Göttingen (1822) under Strohmeyer; the following year in Paris was spent at the Sorbonne, the School of Mines and the College of France. Subsequently, Reich was associated for more than 40 years with the Freiberg School of Mines, including appointments as professor of theoretical chemistry (1842–1856) and professor of physics (1827–1860).

In 1863, while seeking thallium in some zinc ores, Reich obtained a material which he recognized as the sulfide of a new element. Because of his own color-blindness Reich caused his assistant, Hieronymus T. Richter, to execute the necessary spectroscopic examination. Since the flame test showed a brilliant indigo line different from that of cesium, the new element was named indium [J. prakt. Chem. (1) *89*, 441–442 (1863); (1) *90*, 172–176 (1863); (1) *92*, 480–485 (1864)]. Subsequently the assistant attempted to give the impression [cf. J. Chem. Education *7*, 1085–1086 (1930)] that he, rather than Reich, had discovered the new element. Reich and Richter made preliminary studies of simple indium compounds and even obtained the free metal, but extensive studies were (at Reich's suggestion) made by his student Winkler.

P_3B J. Chem. Education *9*, 1429–1434 (1932).

HALLER, ALBIN

Born March 7, 1849, at Felleringen, near Mulhouse, Upper Alsace; died April 29, 1925.

After achieving doctorate (1879) Haller joined staff of the École Superieur de Pharmacie at University of Strassbourg. In 1885 he became professor on the faculty of sciences at University of Nancy. He succeeded (1899) Friedel as professor of organic chemistry at the Sorbonne, University of Paris, and upon the retirement of Lauth became also director of the Municipal School of Chemistry and Physics of the City of Paris, retaining this position until his death.

Haller published more than 250 research papers on topics which included the chemistry of camphor and its relatives, phthaleins, anthrones, indanones, anthracene derivatives, pseudoacids, etc. He was first to demonstrate that camphor is a ketone, and that it contains the $-CH_2-CO$ group; he first prepared iodocamphor and cyanocamphor and achieved a partial synthesis of camphor itself which laid the basis for the later establishment by Bredt of its present formula. Haller was first to recognize and extensively elaborate the value of sodamide in organic synthesis [for surveys of use of alkali amides see Bergstrom and Fernelius, Chem. Revs. *12*, 43–179 (1933); *20*, 413–481 (1937)]. He was first to recognize that borneol and isoborneol are stereoisomerides and to discover and name alcoholysis [Compt. rend. *143*, 657–661 (1906); Bull. soc. chim. (4) *1*, 876 (1907)].

Haller became a member of the French Academy of Science in 1900 and its president in 1923. He served several times as president of the French Chemical Society. He received in 1917 the Davy Medal of the Royal Society of London of which he became a foreign member in 1921. He was an editor of the Ann. chim. phys. (1907–1914) and upon its separation into two individual journals served (1914–1925) with C. Moureu as editor of the Ann. chim.

P_1B Bull. soc. chim. (4) *39*, 1037–1092 (1926) (incl. bibliog.): B J. Chem. Soc. *1927*, 3174–3178: B Proc. Roy. Soc. (London) *118-A*, I–III (1928): B Nature *115*, 843–844 (1925): P_3B Rév. gen. colloides *3*, 176–178 (1925): BP J. pharm. Alsace Lorraine *52*, 108–110 (1925): B Ann. chim. (10) *4*, 5–8 (1925): B Bull. soc. chim. (4) *37*, 685–688 (1925): B Bull. sci. pharm. 32, 347–351 (1925): B Bull. soc. chim. ind. Mulhouse *91*, 317–319 (1925): Bull. soc. chim. Belg. *34*, 160 (1925): PB Parfums France, No. 30, 213–221 (1925).

Del Rio, Andres Manuel

Born Nov. 10, 1764, in Madrid, Spain; died March 23, 1849.

After a bachelor's degree from the University of Alcalá de Henares, Del Rio was sent by his government to study at Paris under Darcet, at the Royal School of Mines in Freiberg, Saxony, under A. G. Werner, and at the Royal School of Mining and Forestry at Schemnitz, Hungary.

At age 30 he accepted an appointment at Mexico City and in 1795 began to teach at the School of Mines, just founded (1792) by Don Fausto de Elhuyar, a course in oryctognosy which included mineralogy, geognosy and paleontology, His first edition (1795) of "Elements of Oryctognosy" [reviewed in Ann. chim. (1) *21*, 221–224 (1797)] was regarded by von Humboldt (who had been his schoolmate at Freiberg)

as the best mineralogical work which Spanish literature possessed at the time. Del Rio served about 50 years (1795–1849) as professor at the Mexico City School of Mines; in 1828, however, when most Spaniards were expelled from Mexico and despite his exception by the government, he voluntarily came to the United States and spent four years at Philadelphia.

In 1801 Del Rio discovered the element now known as vanadium. He first designated it as panchromium, then later as erythronium, but because its properties so closely resembled those described by Fourcroy for chromium, Del Rio became doubtful of the novelty of his material and published his work as, "The Discovery of Chromium in the Brown Lead of Zimapan." After the lapse of some 25 years, the Swedish chemist, Sefström, independently obtained (1830) from some Taberg iron a supposedly new element, noticed the beautiful colors displayed under certain circumstances by its solutions, and in allusion to Vanadis, the Scandinavian goddess of beauty, named it vanadium. Almost simultaneously Wöhler examined a sample of Del Rio's ore which had been brought to Europe by von Humboldt and found [(Poggendorf's) Ann. Physik *21*, 49 (1831)] that Sefström's vanadium was the element so long before designated by Del Rio as erythronium. An extensive study of vanadium compounds was concurrently made by Berzelius but it was not until June 16, 1869, that the isolation of metallic vanadium was announced by Sir Henry Roscoe.

P_3B J. Chem. Education *12*, 161–166 (1935); *11*, 413–419 (1934).

DÖBEREINER, JOHANN WOLFGANG.

Born Dec. 13, 1780, at Hof, Bavaria, Germany; died March 24, 1849, at Jena, Germany.

Although meagerly trained in science, Döbereiner developed great research ability and became (1810–1849) professor of chemistry, pharmacy and technology at the University of Jena. He was first (July 27, 1823) to observe that *at ordinary temperature* finely divided platinum was able to cause spontaneous ignition of hydrogen and oxygen as a result of which he developed a famous "Zündemaschine" (Döbereiner's lamp) or lighter [for history see Angew. Chem. *50*, 46–50 (1937); Chem. Ztg. *46*, 677–679 (1922); *57*, 2–3 (1933)].

In 1817 [(Gilbert's) Ann. Physik. *57*, 435–438 (1817)] and more fully in 1829 [(Poggendorf's) Ann. Physik. *15*, 301–307 (1829)] he called attention to the existence of *triads*, i. e., groups of three elements (e. g., chlorine, bromine, iodine; calcium, strontium, barium; lithium, sodium, potassium; sulfur, selenium, tellurium) in which the properties

of that with intermediate atomic weight are also intermediate between those of the other two.

As the result of observation of an oily by-product obtained during the preparation of formic acid from carbohydrate material by the action of sulfuric acid and manganese dioxide, Döbereiner was the first [Ann. *3*, 141–146 (1832)] to obtain furfural. He was also the first to observe acetaldehyde-ammonia but this was fully characterized [Ann. *14*, 133–151 (1835); *22*, 273–277 (1837)] by Liebig. Döbereiner also made extensive studies on the oxidation of alcohol to acetic acid and is regarded [(Poggendorf's) Ann. Physik. *24*, 594–603 (1832)] as the real founder of rapid acetic acid manufacture.

P_3B J. Chem. Education 9, 1593–1594 (1932); B Z. Angew. Chem. *36*, 482–484 (1923).

LAPLACE, PIERRE-SIMON, MARQUIS DE

Born March 28, 1749, at Beaumont-en-Auge, in the Département Calvados of the Normandy district of France; died March 5, 1827, at Paris.

Laplace was a distinguished mathematician and astronomer. His systematic integration of the work of three generations of illustrious mathematicians in the monumental "Mécanique Célèste" (five volumes 1799–1825) is regarded as one of the greatest contributions to the development of science. The brilliant memoirs on the theory of probability led to his election as an associate (1773) and later as a full member (1785) of the French Academy of Sciences. His complete works were eventually republished by the French government (seven volumes 1843–1847) with a second edition in 1912.

KLEIN, CHRISTIAN FELIX

Born April 25, 1849, at Düsseldorf, Germany; died June 22, 1925, at Göttingen, age 76.

Klein was a mathematician, especially concerned with its application to physics, and regarded as one of the greatest and most influential of modern times. At age 17 he became assistant to J. Plücker at Bonn, later student of Clebsch at Göttingen, and Kummer at Berlin. He became (1872–1875) professor of mathematics at University of Erlangen and later occupied similar chairs at Munich Technische Hochschule (1875–1880), University of Leipzig (1880–1886) and finally Göttingen (1886–1913). He founded *Enzyklopädie der Mathmatischen Wissenschaften* (1895) and long (1872–1925) served as editor of the *Mathematische Annalen* founded (1868) by Carl Neumann [Math. Ann. *96*, 1–25 (1927)].

His mathematical researches were chiefly concerned with geometry and theory of functions; his numerous books included a monumental treatise (1897–1910) with A. Sommerfeld on the theory of the top, and a brief autobiography. He traveled widely, lecturing many times in England and on two trips to America, where (1893) he represented Göttingen at the Columbian Exposition in Chicago. In 1908 he served as president of an International Commission on the Teaching of Mathematics.

P_1B Proc. Roy. Soc. (London) *A–121*, I–XIX (1928): P_1B Jahresber. Deut. Math. Ver. *27*, 217–228 (1918); *34*, 89, 197–213 (1925): P_1B Naturwissenschaften *7*, 275–317 (1919) (incl. bibliog.); B ibid. *13*, 765–772 (1925); B ibid. *14*, 1042–1043 (1926): P_1B Z. tech. Phyzik *7*, 2–7 (1926): P_3B Z. Ver. deut. Ing. *69*, 1118–1119 (1925): B Z. angew. Math. u. Mech. *4*, 86–92 (1924); *5*, 358–359 (1925): B Proc. Nat. Acad. Sci. U. S. *13*, 611–613 (1927): B Nature *116*, 475–476 (1925). B London Math. Soc. *1*, 25–32 (1926).

Hill, Henry Barker

Born Apr. 27, 1849, at Waltham, Mass.; died April 6, 1903.

Son of Rev. Thomas H. Hill (president of Harvard University, 1862–1868), H. B. Hill graduated from Harvard (1869), then spent next year in Berlin studying under A. W. Hofmann. On returning he was connected with the Harvard staff of chemistry for thirty-three years, successively as assistant (1870–1874), assistant professor (1874–1894), professor and director of the laboratory (1894–1903). In 1891–1892 he also taught organic chemistry at Mass. Inst. of Technology. Among his students who subsequently became notable were A. M. Comey, W. J. Hale, W. L. Jennings, C. F. Maberry, G. Oenslager, H. A. Torrey, and others.

His first two papers described a method of attack on the structure of uric acid subsequently employed by Emil Fischer with conspicuous success. However, in the course of his service for some years as consultant for the Carter's Ink Co. of Cambridge, Mass., Hill was led to study some by-products of the manufacture of acetic acid by distillation of wood. His recognition of furfural in this material led to more than 30 papers on furan chemistry, mainly published in the Proceedings of the American Academy of Arts and Sciences and in the American Chemical Journal. This work included a full study of mucobromic and mucochloric acids and establishment of their structures. This led to the discovery of nitromalondialdehyde and to a long line of ingenious syntheses of products derived from its reaction with other materials.

P_1B Biog. Memoirs Natl. Acad. Sci. *5*, 255–266 (1905) (incl. bibliog.): B Am. Chem. J. *30*, 80–82 (1903): B J. Am. Chem. Soc. *25*, Proceedings A. C. S., 97–98 (1903): B Science *17*, 841–843 (1903): B Ber. *36*, 4573–4581 (1903) (incl. bibliog.): B Dict. Am. Biog. *9*, 33–34 (1932).

JENNER, EDWARD

Born May 17, 1749, at Berkeley, Gloucestershire, England; died Jan. 26, 1823, at Berkeley.

Jenner is regarded as the true discoverer of vaccination against smallpox. He was a physician and pupil of John Hunter in London. His investigations began about 1776 from the observation that persons who previously had cowpox were not susceptible to smallpox. Following a specific opportunity in 1796 to demonstrate the validity of this theory, he published (1798) a short treatise which led Cline, surgeon at St. Thomas' Hospital, to introduce vaccination at that institution, following which it was rapidly adopted in the army and navy and presently throughout the civilized world. Many honors were given to Jenner, including grants totalling 30,000 pounds from the British Government. Numerous book biographies of Jenner are available.

He is buried in the chancel of the parish church at Berkeley.

MUNROE, CHARLES EDWARD

Born May 24, 1849, at East Cambridge, Mass.; died Dec. 7, 1938, at Forest Glen, Maryland, in his ninetieth year.

He received S.B. (1871) from Lawrence Scientific School of Harvard University, where for next three years he assisted Profs. O. W. Gibbs and J. P. Cooke, and where the later distinguished F. W. Clarke, H. B. Hill, C. L. Jackson, and H. W. Wiley were among his close friends. During this period he established (1872) the first Harvard course in chemical technology, and the first (1873) summer school of chemistry in the United States. For the next dodecade (1874–1886) he was professor of chemistry at the U. S. Naval Academy at Annapolis, Md., leaving only for research (1886–1892) at the U. S. Naval Torpedo Station and War College at Newport, Rhode Island. His next move was to chair of chemistry at Columbian College (now George Washington University) at Washington, D. C., where he was dean of the Corcoran Scientific School (1892–1898) and of the School of Graduate Studies (1892–1917). During his 46 years in Washington, Munroe was also consultant on explosives in many government connections and was chief explosive chemist for the U. S. Bureau of Mines (1910–1933) from its inception to his own retirement.

Munroe's name is most widely associated with the "Munroe effect" by which designs upon a block of explosive can be transmitted to metallic surfaces. Examples of this phenomenon prepared by Munroe himself are preserved in a fire-screen at the Cosmos Club in Washington and very large and remarkable extensions of this principle by Imperial Chemical Industries, Ltd., were shown at the 1948 Scientific Information Conference of the Royal Society at London. He also invented (U. S. 489,684, Jan. 10, 1883) "Indurite," a variety of smokeless powder which comprised an important advance at the time and was specifically commended by President Harrison in his farewell message to Congress. While still at Harvard he invented the platinum felt filter or Munroe crucible.

Munroe was the last surviving charter member of the American Chemical Society (founded in 1876), its president in 1898–1899, and was instrumental in the establishment of the principle of local sections and general meetings, the first of which later was held in Newport, Rhode Island, Aug. 6–7, 1890, during Munroe's duty there. He served continuously as associate editor on explosives for Chemical Abstracts for 32 years (1907–1939), and wrote nearly 300 articles and reports. Although absolutely fearless in the handling and investigation of explosives for 60 years, he took such care and precautions that he never suffered a serious accident.

P_1B J. Am. Chem. Soc. *61*, 1301–1316 (1939) (incl. bibliog.): P_3B Ind. Eng. Chem. *15*, 648–649 (1923): P_1B J. Chem. Education *4*, 276–277 (1927): P_3B J. Chem. Education *5*, 1484–1485 (1928): P_3B Ind. Eng. Chem., News Ed. *14*, 223 (1936); *16*, 647 (1938): B Science *89*, 26–27 (1939): P_3B Chemist *15*, 385–389 (1938): P_1B Explosives Engineer *1*, 2–3 (1923): B J. Chem. Soc. *1939*, 731–732: P_3B Z. ges. Schiess-u. Sprengstoffw. *24*, 121–124 (1929); *34*, 111 (1939): B Gen. Sci. Quart. *10*, 479–491 (1926): P_3B Natl. Cycl. Am. Biog. *29*, 334 (1941).

Jones, William

Born 1675 in the parish of Llanfihangel in the Angelsey island county of North Wales; died July 3, 1749, in London.

Jones was a mathematician and teacher. He was a friend both of Sir Isaac Newton and of Edmund Halley the astronomer. His writings include both navigation and general mathematics. In a "New Introduction to the Mathematics" (1706) he first employed the symbol π for the circle ratio. In 1711 he was one of a committee ap-

pointed by the Royal Society of London to decide who had invented the infinitesimal calculus.

B Natl. Dict. Biog. *30*, 173–174 (1892).

OSLER, SIR WILLIAM

Born July 12, 1849, at Bond Head, Tecumseth County, Ontario, Canada (about 50 miles north of Toronto); died Dec. 29, 1919, at Oxford, England.

Osler's teaching and personality have strongly influenced the progress of medical science. After receiving his M.D. (1872) from McGill University and spending several years (1872–1874) in Europe, he became (1875–1884) professor at McGill Medical School, then professor of medicine (1884–1889) at the University of Pennsylvania, physician-in-chief at Johns Hopkins Hospital and professor of medicine at Johns Hopkins University at Baltimore, Maryland (1889–1905), and finally Regius professor of medicine at Oxford University, England (1905–1919).

Osler was the author of more than 730 articles and books, a bibliography of which, assembled by M. W. Blogg, appeared in the Bulletin of Johns Hopkins Hospital for July 1919. These included the Principles and Practice of Medicine (1891) which has since passed through many editions (11th, 1930) and translations. It was the perusal of this book by Rev. F. T. Gates, advisor to Mr. John D. Rockefeller, that led to the latter's heavy endowments of higher medicine and education.

It has been said of Osler by his one-time colleague, Dr. William Henry Welch, that at the time of his death, "he was probably the greatest figure in the medical world, the best-known, the most influential, the most beloved." The two volumes, "Life of William Osler", (1925) by the distinguished surgeon, Harvey Cushing, received the Pulitzer prize for biography. Osler was made a baronet in 1911. As he directed, his ashes rest in the Osler Memorial Library of McGill Medical School at Montreal.

P_1B Proc. Roy. Soc. (London) *92-B*, xvii–xxiv (1921): B Proc. Am. Acad. Arts Sci. *57*, 496–499 (1921–2): B Dict. Am. Biog. *14*, 83–87 (1934).

REVERDIN, FREDERIC

Born July 17, 1849, at Cologny, near Geneva, Switzerland; died Feb. 26, 1931, at age 82.

Reverdin entered (1869) the Federal Polytechnicum in Zurich under

Emil Kopp and Victor Meyer and during this period became a close friend of E. Noelting with whom he later extensively collaborated. After brief sojourns in Berlin and at Heidelberg, he became (1872) research chemist for a dyestuff factory established by P. Monnet at La Plaine near Geneva (later to become the Societé Chimique des Usines du Rhone) where he was rejoined (1877) by Noelting. After 14 years Reverdin transferred to Meister Lucius Brüning at Höchst for a 15-year period. His final association was with l'Ecole de Chimie at Geneva where for 23 years (1907–1930) he remained. On his 75th anniversary both the Federal Polytechnicum and the University of Geneva awarded him honorary doctorates. He was Swiss delegate to the 7th Congress of Applied Chemistry in London (1909) and the 8th in New York (1912).

Reverdin's connection with the dyestuff industry at a period when the rapid developments of organic chemistry were stimulating its phenomenal growth led to a wide variety of publications both on dyestuffs and the structure and purity of their intermediates. Current students are constantly being led to his publications not only in Swiss journals but also those of France, England, and Germany. He was early concerned with studies of the triphenylmethane colors and with the manufacture of alkyl chlorides from the alcohols with hydrochloric acid under pressure. He discovered [Bull. soc. chim. (3) *15*, 638–646 (1896)] the peculiar migration of iodine occurring during the nitration of p-iodoanisole and was led to a long series of investigations on the nitration of variously substituted phenols, and to his studies of the behavior of nitramines with sulfuric acid.

With his friend de la Harpe he translated (1878) to the French the 10th German edition of Fittig's *Textbook of Organic Chemistry*, and prepared (1880) with Noelting the *Tables of Naphthalene Derivatives* subsequently to pass (1894) through a second edition and eventual revision (1927) in the two volumes by Van der Kam.

P_1B Helv. Chim. Acta *14*, 1046–1067 (1931): B Ber. *64-A*, 106–107 (1931).

MELDOLA, RAPHAEL

Born July 19, 1849, at Islington, London; died Nov. 16, 1915.

Meldola came of an ancient Sephardic family of Spanish and Portuguese Jews whose genealogy could be traced unbroken through 16 generations back to Isaiah Meldola (1282–1340) of Toledo. He entered (1866) the Royal College of Chemistry as pupil of Edward Frankland; then (1868–1871) was assistant in the private laboratory

of John Stenhouse. In 1872 he rejoined Frankland on the staff of the Royal College (meantime transferred to South Kensington) where he also worked with (Sir) Norman Lockyer for 3 years on spectrum analysis and photography.

About this time he spent 8 years in industrial dyestuff work during which he discovered (1879) the first oxazine dyestuff (still known as Meldola's blue) and made other substantial contribution to synthetic coloring matters.

In 1885 Meldola was appointed professor of chemistry at Finsbury Technical College (Sylvanus Thompson being simultaneously called to the chair of physics) where he remained (1885–1915) for the ensuing 30 years of his life and where he numbered among his students such men as (Sir) M. B. Forster, (Sir) G. T. Morgan, and (Sir) W. J. Pope. His researches effected great progress in knowledge of structure and isomerism of diazoamino compounds, of *o*-amino and *o*-hydroxyazo compounds, imidazoles, and displacement of groups in aromatic compounds. He discovered 1-amino-2-naphtholsulfonic acid-6 whose salt is the photographic developer "Eikonogen" [J. Soc. Chem. Ind. *8*, 958–959 (1889)].

His first academic recognition was an honorary Sc.D. from the University of Oxford (1910) but he received many distinguished medals and offices. His earliest work was in the field of biology and nature study and he was secretary of the Entomological Society (London) (1886–1880) and its president (1895). He was president of the (British) Chemical Society (1905–1907), the Society of Dyers and Colourists (1907–1908) (succeeding W. H. Perkin), the Society of Chemical Industry (1908–1909), and the Institute of Chemistry (1912–1915).

P_1B Proc. Roy Soc. (London) *93-A*, XXIX–XXXVII (1916–7): B J. Chem. Soc. *111*, 349–359 (1917): B Nature *96*, 345–347 (1915–6): B J. Soc. Dyers and Colourists *31*, 260–262 (1915): B Ber. *48*, 2097 (1915): P_1B Findlay and Mills "British Chemists" (Chem. Soc. London 1947), pp. 96–125.

KJELDAHL, JOHAN GUSTAV CHRISTOFFER THORSAGER

Born Aug. 16, 1849, in Jaegerspris, in northern part of the Danish island of Zealand; died July 18, 1900, at Tisvilde, Zealand, Denmark.

Kjeldahl took his baccalaureate degree (1867) at the gymnasium of Roeskilde, then went for further study and chemical training to both the University and Technische Hochschule of near-by Copenhagen. After passing his examinations (1873) with special distinction he

briefly assisted C. F. Barfoed at the chemical laboratory of the Royal Danish Agricultural School but soon (October, 1876) transferred to the newly established Carlsberg Laboratory in Copenhagen, where he spent the remaining 25 years of his life.

Although Kjeldahl made numerous investigations on other topics such as the behavior of enzymes, the determination of various sugars and mixtures of sugars by the Fehling titration method, and the optical rotation of vegetable proteins, his name is most widely associated with the method which he devised for the quantitative determination of nitrogen, and with the particular type of long-necked glass flask which it employs. The method was first disclosed in a lecture on March 7, 1883, but was published soon afterward [Z. anal. Chem. *22*, 366–382 (1883)]. In 1894 he was awarded an honorary doctorate by the University of Copenhagen.

The Kjeldahl determination of nitrogen is based upon decomposition of the organic sample with hot concentrated sulfuric acid in the presence of suitable catalysts; the nitrogen is converted to ammonia which is subsequently liberated with alkali and distilled into a known excess of standard acid. After simple titration of the residual acidity the amount of ammonia (and therefore the nitrogen in the original sample) is readily calculable. The method is much simpler and more accurate than combustion but cannot be applied to as wide a range of nitrogen compounds.

P_1B Ber. *33*, 3881–3888 (1900); P_3B J. Chem. Education *11*, 457–462 (1934).

Hell, Carl Magnus von

Born Sept. 8, 1849, at Stuttgart, Germany; died Dec. 11, 1926, at age 77.

C. M. von Hell was a student of Fehling at Stuttgart and of Erlenmeyer at Munich; in 1883 he succeeded the former.

In 1889 he effected the synthesis of the paraffin hydrocarbon $C_{60}H_{122}$ which during his lifetime was the highest known alkane. He was much interested in acids and published numerous studies of those of the dibasic type. His name is most frequently associated, however, with the so-called Hell-Volhard-Zelinsky procedure for the bromination of acids in the presence of phosphorus. The initial publication of Hell [Ber. *14*, 891–893 (1881)] was independently confirmed by those of Volhard [Ann. *242*, 141–163 (1887)] and Zelinsky [Ber. *20*, 2026 (1887)].

B Ber. *60-A*, 54–55 (1927).

PAVLOV, IVAN PETROVICH

Born Sept. 27, 1849 (new style) (Sept. 14, old style), at Ryazan (about 100 miles southeast of Moscow); died Feb. 27, 1936, at age 86.

Regarded as one of the greatest physiologists of last and present centuries, Pavlov attained a unique and almost legendary position in science. His early training in science at the University of St. Petersburg was extended by studies at the Military Medical Academy, where under the physiologist Cyon (Tsion) (the discoverer of the depressor nerve) he enthusiastically entered upon physiological research during which he discovered (1888) the secretory nerves of the pancreas. After being licensed in medicine (1879), obtaining his M.D. degree (1883), and spending several years in Germany under Ludwig at Leipzig and Heidenhain at Breslau, he became (1890) director of the physiological department of the newly established Institute of Experimental Medicine at St. Petersburg. Without giving up this post he also served (1897–1914) as professor of physiology at the Military Medical Academy, while in 1907 he became one of four scientific members of the St. Petersburg Academy. These concurrent appointments resulted in his work being carried on in three laboratories.

Pavlov's scientific career embraced three distinct phases. The first was concerned with studies of the circulatory system with particular reference to the efferent nerves of the heart and with heart rate and led to his discovery of the pressor influence of the vagus nerve. The second (1888–1906) comprised his epochal studies on secretion and digestion, resulted in some 130 scientific communications from his laboratories and culminated in the award to him of the 1904 NOBEL PRIZE FOR PHYSIOLOGY AND MEDICINE, "in recognition of his work on the physiology of digestion which essentially reformed and extended scientific knowledge in this field." The third period (1907–1936), primarily devoted to his studies of conditioned reflexes, yielded results which have had profound influence upon scientific understanding of the physiology of the brain and sense organs and upon the sciences of psychology and psychiatry.

P_1B Obit. Notices Fellows Roy. Soc. (London) *2*, 1–18 (1936): P_1B Nature *115*, 1–3 (1925): B Nature *137*, 483–485 (1936): B Science *83*, 351–353 (1936): B Proc. Roy. Soc. Edinburgh *56*, 264–275 (1935–6): B Nature *154*, 385–388 (1944): B Bull. soc. sci. hyg. aliment. *24*, 344–362 (1936).

SCHÖNBEIN, CHRISTIAN FRIEDRICH

Born Oct. 18, 1799, at Metzingen, Swabia (Württemberg), Germany; died August 29, 1868, at Sauersberg, near Baden-Baden.

Schönbein's early contacts with chemistry were as helper in various chemical factories, including a brief period in that of Johann Gottfried Dingler, who enlisted his assistance with the famous "Polytechnisches Journal", then (1820) just being launched. With various interruptions he attended both the University of Tübingen and that of Erlangen and subsequently spent two years in England and one in Paris. In 1828 he was called to the University of Basle in Switzerland where in 1835 he became professor of physics and chemistry. When (1852) a separate chair of physics was created, Schönbein continued to occupy that of chemistry for the rest of his life, thus completing 40 years continuously at Basle.

Schönbein discovered (1839) ozone and gave it that name; this formed part of a 29-year study of oxygen which brackets his name with those of Priestley, Scheele and Lavoisier. On May 7, 1846, at a meeting of the Society of Scientific Research at Basle, he announced the discovery of guncotton. Although the action of nitric acid upon paper, linen and cotton fibers had earlier been examined by Pelouze, Schönbein was the first to employ a mixture of nitric and sulfuric acids, and actually to demonstrate the use of the product as a propellant in guns and as an explosive in mines, and is therefore regarded by the explosives industry as the discoverer of nitrocellulose. In the course of studies of the solubility of his mixed cellulose nitrates, Schönbein found that evaporation of an ether-alcohol solution left a flexible film, and the first medical use of this as a coating (collodion) was made at Schönbein's suggestion by his friend Dr. Jung of Basle.

Schönbein was an active correspondent with many other contemporary scientists and his correspondence with Berzelius, with Liebig, and with Faraday has been published in book form.

P_2B J. Chem. Education *6*, 410, 432–440, 677–685 (1929): P_2 ibid. *7*, 1832–1833 (1930): B J. Chem. Soc. *22*, X–XIII (1869): B Ann. Repts. Smithsonian Inst. *23*, 185–192 (1868): P_1B Bugge "Das Buch der Grossen Chemiker" *1*, 458–468 (1929) B Nitrocellulose *1*, 1–2 (1930).

RUTHERFORD, DANIEL

Born Nov. 3, 1749, at Edinburgh, Scotland; died Dec. 15, 1819.

This notable Scotch physician was an uncle of the distinguished novelist and poet, Sir Walter Scott. A student of William Cullen and

Joseph Black he succeeded (1786) John Hope in chair of botany at University of Edinburgh, where he remained 33 years.

Just as the dissertation of his celebrated professor, Joseph Black (published June 11, 1754) had contained the discovery of carbon dioxide, so that of Daniel Rutherford (dated Sept. 12, 1772, at age 23) made clear the existence of nitrogen (phlogisticated air) as distinct from carbon dioxide (fixed air). The only known copy of this thesis is preserved in the British Museum but Crum-Browne's translation of its Latin text has been published [Dobbin, J. Chem. Education *12*, 370–375 (1935)]. The new gas was also independently discovered about the same time by Scheele, Priestley, and Cavendish, but the name nitrogen was not given to it until 18 years later (1790) by Chaptal. Rutherford also invented a maximum and minimum thermometer still described in many modern physics textbooks, but the discovery of nitrogen was his only contribution to chemistry.

It is a curious and unexplained coincidence that Dr. Rutherford's mother, he himself, and a sister all died suddenly within scarcely more than a single week.

P_3B J. Chem. Education *11*, 101–107 (1934); *9*, 219–221 (1932)· B Science Progress *29*, 650–660 (1935): Dict. Natl. Biog. *50*, 5–6 (1897).

DANA, EDWARD SALISBURY

Born Nov. 16, 1849, New Haven, Conn.; died June 16, 1935, at age 85.

E. S. Dana was the son of James Dwight Dana (himself an eminent mineralogist) and the grandson of Benjamin Silliman. After B.S. (1870) from Yale he studied (1870–1872) with G. J. Brush at Sheffield Scientific School, then (1873) with Bunsen at Heidelberg and (1874) with Tschermak at Vienna. He received M.A. (1874) and Ph.D. (1876) from Yale, his dissertation for the latter representing the first important application in America of microscopical petrography. Since at the time Yale had no staff opening in mineralogy, Dana first held (1876–1879) a tutorship in mathematics, physics, and chemistry. After 11 years (1879–1890) as professor of natural philosophy he became professor of physics in which capacity he served (1890–1917) until retirement despite the fact that his outstanding work was exclusively in mineralogy.

E. S. Dana's fame rests mainly on his books. His first volume at age 28 (1877) was the "Textbook of Mineralogy," whose second edition (1898) carried an exposition of optical mineralogy long without equal. Two further editions (1921, 1932) were later prepared by W. E. Ford. His greatest monument, however, was the 6th edition (1892) of his

father's "System of Mineralogy," universally recognized as one of the most remarkable scientific volumes ever published. To keep the system up to date, three appendices (1899, 1909, 1915) have been issued, and a 7th edition is contemplated under supervision of Profs. Palache and Ford.

The American Journal of Science, founded (1818) by Benjamin Silliman, was carried on after his retirement (1885) by the Danas (father and son); after the death of James Dana, son Edward was editor for 31 years (1895–1926). For a history of this remarkable journal, thus under the leadership of grandfather, father, and grandson continuously for 108 years (and still being published) see the article by C. S. Dana in celebration of its centenary [Am. J. Sci. (4) *46*, 1–44 (1918)].

Dana became (1925) honorary president for life of the American Mineralogical Society and at the time of his death had been a member of the National Academy of Science for 51 years, a span then exceeded by only one other. Dana and his wife spent their summers at Seal Harbor, Mt. Desert Island, Maine, where both are buried.

P_1B Am. J. Sci. (5) *30*, 161–176 (1934): P_1B Proc. Geol. Soc. Am. *1935*, 201–214 (incl. bibliog.): P_1B Biog. Memoirs Natl. Acad. Sci. *18*, 349–365 (1938) (incl. bibliog.): P_3B Am. Mineral. *21*, 173–174 (1936): P_3B Mineralog. Mag. *24*, 281–283 (1934–7): B Science 82, 342–344 (1935): B Proc. Am. Acad. Arts Sci. *70*, 517–518 (1934–5): B Quart. J. Geol. Soc. London *92*, LXXXIX–XCI (1936): B Dict. Am. Biog. *21*, 221–222 (1944): B Natl. Cycl. Am. Biog. *30*, 332 (1943).

FLEMING, SIR JOHN AMBROSE

Born Nov. 29, 1849, at Lancaster, Lancashire, England; died April 18, 1945, at Sidworth, Devon, England, at age 95.

Fleming was primarily an electrical engineer and a physicist but his early training was chemical. He entered (1866) University College, London, receiving B.Sc. in 1870, and (1871) Royal College at So. Kensington as chemical student of Frankland and his then assistant, Meldola, working chiefly on organometallic compounds. He invented a form of voltaic cell [Proc. Phys. Soc. London *1*, 1–12 (1874)] comprising not only his first publication but also the first paper presented before the newly formed Physical Society of London of which he became the last surviving charter member. He entered (1877) St. John's College at Cambridge University, where he attended the last two years of Maxwell's lectures and worked in the Cavendish laboratory, mainly on resistance standards. After a period (1879–1884) of varied consulting in industry, he became the first professor of electrical

engineering at University College, London, where he remained (1885–1926) for 41 years.

Fleming was a pioneer in the application of electrical science to problems of electric lighting, wireless telegraphy and telephony. He devised a standard lamp for photometric measurements, carried out with Dewar studies on the magnetic and electrical properties of metals at low temperatures, and constructed (1883) the first direct reading potentiometer. He designed for Marconi the power transmitter at Poldhu, Cornwall, which on Dec. 12, 1901, effected the first transatlantic wireless communication. In 1904 he developed the so-called "Edison effect" (1883) into the first thermionic vacuum tube rectifier [Brit. Pat. 24,850, Nov. 16, 1904; U. S. 803,684, April 19, 1905] or Fleming valve [see Franklin Medal address, Science *81*, 625–628 (1935)], the precursor of the amplifying triode tube first described four years later by Lee DeForest in America. Fleming's invention also preceded by two years the invention by H. H. C. Dunwoody of the first (carborundum) crystal detector of wireless signals.

Fleming was author of many books and articles on electrical subjects and (1934) of an autobiography, "Memoirs of a Scientific Life." He received many distinguished medals, was elected to Royal Society in 1892, and knighted in 1929.

P_1B Obit. Notices Fellows Roy. Soc. (London) *5*, 231–242 (1945): P_3B J. Telev. Soc. *4*, 266–273 (1946): B J. Inst. Elec. Engrs. *92*, I 467–468 (1945): B Nature *155*, 662–663 (1945): B Proc. Phys. Soc. London *57*, 581–584 (1945).

WAGNER, GEORG

Born Nov. 29, 1849, at Kasan, Russia (about 360 miles east of Moscow); died Nov. 27, 1903, at Warsaw, Poland.

Wagner's father was German, his mother Russian. At age 16 he entered University of Kasan to study law but after two years abandoned this intention to become a chemical pupil of A. Saytzeff. On completion of his course he went (1874) to St. Petersburg to work under Butlerow. In 1882 after the death of his young wife he removed to the Hochschule at Novo Alexandria in the Lublin province of Russian Poland. Shortly thereafter (1886) he was appointed assistant professor of organic chemistry at the University of Warsaw, from which he subsequently (1902) withdrew upon completion of the new laboratory of the Warsaw Polytechnic Institute, where he became associate professor and head of the chemical division.

His chemical work comprised three recognizable periods. The first (1875–1885), begun at Kasan and continued at St. Petersburg and

Novo Alexandria, was mainly concerned with the synthesis of secondary alcohols and studies of their oxidation to ketones and culminated with the Master's degree of St. Petersburg. The second (1886–1889) comprised studies on the oxidation of unsaturated hydrocarbons to glycols by means of dilute aqueous potassium permanganate, some parts of it comprising Wagner's doctoral dissertation (1888) at the University of Warsaw. The third period (1890–1903) was characterized by extensive studies in the terpene series and, among other results, led to his establishment of the first correct structures for limonene, pinene, and camphene. By most students of organic chemistry, however, his name is associated with the Wagner (or Wagner-Meerwein) rearrangement.

P_1B Ber. *36*, 4591–4613 (1903).

BLACK, JOSEPH

Born April 16, 1728, in Bordeaux, France; died Dec. 6, 1799, at Edinburgh, Scotland.

Although born in France, Black was of Scottish parents. In 1746 he matriculated at the University of Glasgow as a student of William Cullen whom he later succeeded. In 1750 he began the study of medicine at the University of Edinburgh, where in 1754 his dissertation comprised the discovery of "fixed air" (carbon dioxide) [for Crum-Brown's translation of this Latin thesis, see J. Chem. Education *12*, 225–228, 268–273 (1945)], the first recognized pure gas. Note, however, that another twenty-five years elapsed before its true composition was established (1779) by Lavoisier.

Black served (1756–1766) as professor of chemistry and medicine at the University of Glasgow and as professor of chemistry (1766–1799) at the University of Edinburgh. He was regarded as a perfect lecturer and his manuscript notes have been published [Ann. Sci. *1*, 101–110 (1936)]. He was the first to recognize (1761) the existence and significance of "latent heat" (to which he gave this name) and to study "specific heat," i. e., to invent and use the calorimeter.

Upon the suggestion of Lavoisier, Black was named by the French Academy of Sciences as one of its eight foreign members. He never married. His grave in Greyfriars Churchyard at Edinburgh has been marked by a memorial tablet. [P_3 J. Chem. Education *10*, 716 (1933)].

P_1B Isis *25*, 372–390 (1936): P_3B J. Chem. Education *8*, 2138–2139 (1931); *13*, 503–504 (1936): P_2 *11*, 485 (1934): B Chemistry and Industry *20*, 530–531 (1942): B Chem. Ztg. *52*, 913 (1928): B School Sci. Rev. *18*, 45–49 (1936): B Dict. Natl. Biog. *5*, 109–112 (1886): P_3B Chem. Weekblad *16*, 168–178 (1919) (in Dutch).